SYNECOLOGICAL ANALYSIS OF SOME RODENT POPULATIONS (MAMMALIA: RODENTIA) IN SĂNDULENI LOCALITY, BACĂU COUNTY

PARASCHIV Dalia, ARDEI Irina

Abstract. The paper presents the results of the studies conducted in an orchard ecosystem in Sănduleni commune, Bacău County, related to the diversity of rodents. The material captured in the 3 years of survey was represented by 91 individuals, which systematically belong to Rodentia Order, to 2 families (Arvicolidae and Muridae), 6 genera and 9 species. Among these only one species is euconstant – *Apodemus flavicollis*. The species *Microtus arvalis*, *Apodemus flavicollis* and *A. sylvaticus* were identified as eudominant and specific to this type of ecosystem. The most obvious coenotic affinity is between the *Microtus arvalis* and *Apodemus sylvaticus* species (66.6%).

Keywords: rodents, orchard, synecological analysis, Sănduleni, Bacău county.

Rezumat. Analiza sinecologică a unor populaţii de rozătoare (Mammalia: Rodentia) din localitatea Sănduleni, judeţul Bacău. Lucrarea prezintă rezultatele studiilor efectuate într-un ecosistem de livadă din comuna Sănduleni, judeţul Bacău, în perioada 2008-2010, cu privire la diversitatea rozătoarelor. Materialul capturat în cei trei ani de studiu a fost reprezentat prin 91 de indivizi, care din punct de vedere sistematic aparţin Ordinului Rodentia, la 2 familii (Arvicolidae şi Muridae), 6 genuri şi 9 specii. Dintre acestea, o singură specie este euconstantă - *Apodemus flavicollis*. Speciile: *Microtus arvalis*, *Apodemus flavicollis* şi *A. sylvaticus* au fost identificate ca fiind eudominante şi caracteristice pentru acest tip de ecosistem. Cea mai mare afinitate cenotică există între speciile *Microtus arvalis* şi *Apodemus sylvaticus* (66,6%).

Cuvinte cheie: rozătoare, livadă, analiză sinecologică, Sănduleni, judeţul Bacău.

INTRODUCTION

Sănduleni commune is situated in the centre of Bacău County (46º45' latitude and 26º73' longitude) (Fig. 1). The climate of this hilly area has a continental characteristic, the average annual temperature is about 9.5ºC, the precipitations vary around 540 mm and the wind main direction is North and North-West.

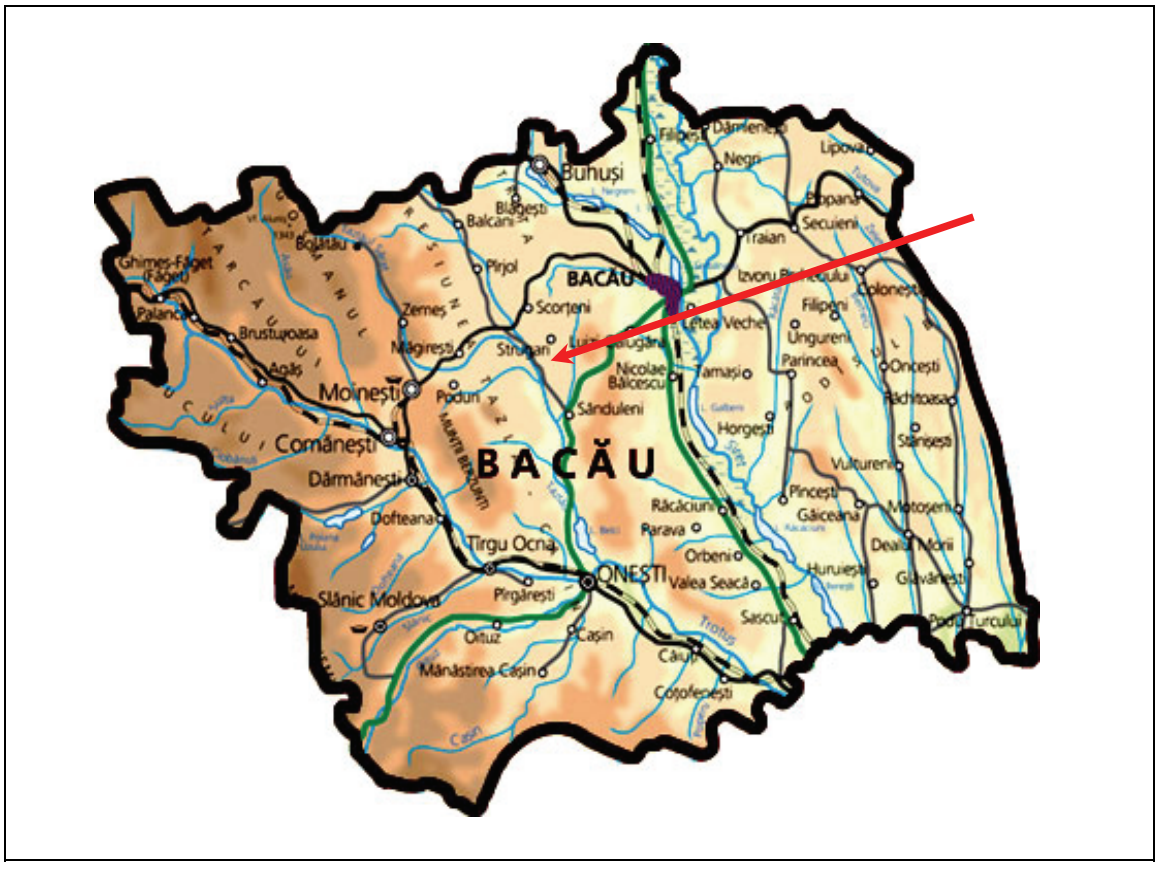

Figure 1. Bacău County map with the location of the study area (www.judetulbacau-harta.ro).
Figura 1. Harta judeţului Bacău cu localizarea zonei de studiu (www.judetulbacau-harta.ro).

The vegetation is determined by relief and climate. In this area there can be met various vegetal associations such as: *Phaleridetum arundinaceae*, *Trifolio-Lolietum*, *Pruno spinosae-Crataegetum*, *Querco robori-Carpinetum*, *Glyceario-Sparganietum neglecti*, *Sambucetum ebuli*, *Tussilaginetum farfarae*, *Onopordetum acanthi* (BARABAŞ, 1974; MITITELU & BARABAŞ, 1978).

The analysed orchard ecosystem is composed of fruit trees such as: *Malus domestica*, *Cerasus avium*, *Prunus domestica* and *Pyrus comunis*. This orchard lies on a surface of approximately 5 ha and is surrounded by deciduous forests, vineyards and maize fields.

We present in the paper the results of the studies done during 2008-2010 regarding the rodent diversity in the orchard ecosystem in Sănduleni locality, Bacău County.

MATERIAL AND METHODS

During the interval May-October of the years 2008, 2009 and 2010 there was identified a total number of 91 rodents. The material was captured by using 50 live traps, placed as a net in the field at 10 m distance between each other, 3 days consecutively per month (SIMIONESCU, 1984). Thus, for each year of the study there were analysed 6 samples and 18 samples for the whole period of study.

The material was determined by using the specialty literature (IONESCU, 1968; POPESCU & MURARIU, 2001; PUCEK, 1981).

For realizing a synecological analysis we calculated a series of ecological indexes: abundance, constancy, dominance, the index of ecological significance (W) and the similarity index (VARVARA et al., 2001).

RESULTS AND DISCUSSIONS

During 2008-2010 in the orchard ecosystem investigated by us 91 individuals belonging to Rodentia Order were captured: 37 individuals in 2008, 28 in 2009 and 26 in 2010. From a systematic point of view, the individuals belong to 2 families, 6 genera and 9 species. In Table 1 we present the species identified in this ecosystem, for each year of study and the whole period of study.

Table 1. Rodent species collected in the orchard ecosystem in Sănduleni locality, Bacău County (2008-2010).
Tabel 1. Specii de rozătoare colectate în ecosistemul de livadă din localitatea Sănduleni, județul Bacău (2008-2010).

No.	Order	Family	Species	No. of specimens			Total
				2008	2009	2010	
1	Rodentia	Arvicolidae	*Clethrionomys glareolus* (SCHREBER, 1780)	3	2	1	6
2			*Pitymys subterraneus* (DE SÉLYS-LONGCHAMPS)	1	1	-	2
3			*Microtus arvalis* (PALLAS, 1779)	7	4	5	16
4		Muridae	*Rattus norvegicus* (BERKENHOUT, 1769)	1	-	-	1
5			*Mus musculus* (LINNAEUS, 1758)	-	-	1	1
6			*Mus spicilegus* (NORDMANN, 1840)	2	1	-	3
7			*Apodemus agrarius* (PALLAS, 1771)	-	1	3	4
8			*Apodemus flavicollis* (MELCHIOR, 1834)	16	13	9	38
9			*Apodemus sylvaticus* (LINNAEUS, 1758)	7	6	7	20
		Total		37	28	26	91

The synecological analysis for the 9 rodent species identified in the 18 samples analysed during the 3 years of the study (2008, 2009 and 2010) is shown in Table 2. According to the data in this table only 1 species is euconstant (*Apodemus flavicollis*), 1 is constant (*A. sylvaticus*), 2 are accessory (*Microtus arvalis* şi *Clethrionomys glareolus*) and the other 5 species are accidental.

Regarding dominance, the results indicate 3 eudominant species (*Microtus arvalis*, *Apodemus flavicollis* and *A. sylvaticus*) and 1 dominant species (*Clethrionomys glareolus*). To these there can be added 3 subdominant species (*Pitymys subterraneus, Mus spicilegus* şi *Apodemus agrarius*) and 2 subrecedent species (*Rattus norvegicus* and *Mus musculus*).

The index of ecological significance (W) indicates 3 characteristic species (eudominant) which are best adapted to the ecological factors in this type of ecosystem. Besides these, 4 species are accessory (the dominant and subdominant ones) and 2 are accidental (the subrecedent ones).

To underline the coenotic affinities among the 9 rodent species we found it is necessary to calculate the similarity index (Table 3). On the basis of this index values we were able to realize the dendrogram in figure 2, which graphically illustrates the affinities among species.

According to this dendrogram the most obvious coenotic affinity is between the species *Microtus arvalis* and *Apodemus sylvaticus* – 66.6% (in each year of study their abundance has close values).

Table 2. The synecological analysis for the rodent species collected in the orchard ecosystem in Sănduleni locality, Bacău County (2008-2010).
Tabel 2. Analiza sinecologică pentru speciile de rozătoare colectate în ecosistemul de livadă din localitatea Sănduleni, judeţul Bacău (2008-2010).

No.	Species	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	S_{11}	S_{12}	S_{13}	S_{14}	S_{15}	S_{16}	S_{17}	S_{18}	A	C		D		W	
																					%	cls	%	cls	%	cls
1	*Apodemus flavicollis*	4	4	3	3	2	0	3	3	3	3	1	0	4	3	1	1	0	0	38	77.7	C4	41.8	D5	32.4	W5
2	*Apodemus sylvaticus*	2	3	1	0	0	1	2	2	2	0	0	0	3	2	2	0	0	0	20	55.5	C3	22	D5	12.2	W5
3	*Microtus arvalis*	3	2	0	0	2	0	3	1	0	0	0	0	3	1	1	0	0	0	16	44.4	C2	17.5	D5	7.7	W4
4	*Clethrionomys glareolus*	2	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	6	27.7	C2	6.6	D4	1.8	W3
5	*Apodemus agrarius*	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	4	22.2	C1	4.4	D3	0.9	W2
6	*Mus spicilegus*	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	3	16.6	C1	3.3	D3	0.5	W2
7	*Pitymys subterraneus*	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	11.1	C1	2.2	D3	0.2	W2
8	*Mus musculus*	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	5.5	C1	1.1	D1	0.06	W1
9	*Rattus norvegicus*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	5.5	C1	1.1	D1	0.06	W1
Total		11	10	5	4	5	2	9	7	5	4	2	1	10	8	4	2	1	1	91	-	-	100	-	-	-

Table 3. The values of the similarity index calculated for the rodent species collected in the orchard ecosystem in Sănduleni locality, Bacău County (2008-2010).
Tabel 3. Valorile indicelui de similaritate calculat pentru speciile de rozătoare colectate în ecosistemul de livadă din localitatea Sănduleni, judeţul Bacău (2008-2010).

No.	Species	1	2	3	4	5	6	7	8
1	*Apodemus flavicollis*								
2	*Apodemus sylvaticus*	62.069							
3	*Microtus arvalis*	59.2593	66.6667						
4	*Clethrionomys glareolus*	22.7273	38.4615	45.4545					
5	*Apodemus agrarius*	9.5238	8.3333	10	0				
6	*Mus spicilegus*	14.6341	0	10.5263	0	0			
7	*Pitymys subterraneus*	10	9.0909	0	0	0	0		
8	*Mus musculus*	5.1282	9.5238	11.7647	0	40	0	0	
9	*Rattus norvegicus*	0	9.5238	0	0	0	0	0	0

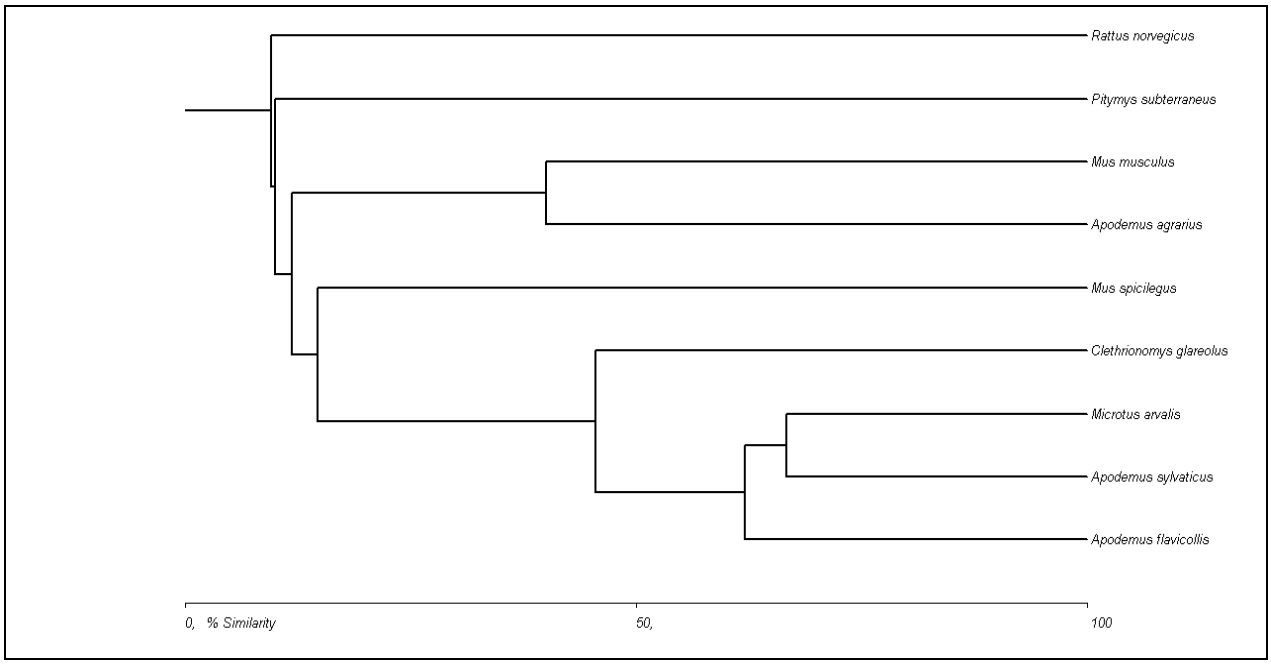

Figure 2. The coenotic affinities among rodent species collected in the orchard ecosystem in Sănduleni locality, Bacău County (2008-2010).
Figura 2. Afinitățile cenotice dintre speciile de rozătoare colectate în ecosistemul de livadă din localitatea Sănduleni, județul Bacău (2008-2010).

CONCLUSIONS

During the interval May-October of the years 2008, 2009, 2010 in the orchard ecosystem in Sănduleni locality, Bacău County, 91 individuals belonging to Rodentia order were captured: 37 individuals in 2008, 28 in 2009 and 26 in 2010. From a systematic point of view the individuals belong to 2 families, 6 genera and 9 species.

For the investigated ecosystem, there was identified only 1 euconstant species (*Apodemus flavicollis*), 1 constant (*A. sylvaticus*), 2 accessory (*Microtus arvalis* and *Clethrionomys glareolus*) and 5 accidental.

According to the synecological analysis *Microtus arvalis*, *Apodemus flavicollis* and *A. sylvaticus* are eudominant species and *Clethrionomys glareolus* is dominant.

The species characteristic for the investigated orchard ecosystem are: *Microtus arvalis*, *Apodemus flavicollis* and *A. sylvaticus*; 4 species are accessory and the other 2 are accidental.

The most obvious coenotic affinity is between the *Microtus arvalis* and *Apodemus sylvaticus* species (66.6%).

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Paraschiv Dalia, Ardei Irina
"Ion Borcea" Natural Sciences Museum Complex Bacău,
Vivariu Department, Popa Şapcă Str., No. 3, Bacău, Romania
E-mail: dalia_yvs@yahoo.com, irinahaidau@yahoo.com

Received: February 28, 2011
Accepted: July 15, 2011